Study of event anisotropy in 158A·GeV Pb+Pb collisions

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Event anisotropy, often called flow, has been observed in heavy ion collisions at every laboratory energy[1]. It is believed that the physics about equation of state (EOS) can be extracted from the study of event anisotropy [2]. In order to understand the recently reported flow results from the 158A·GeV Pb+Pb collisions[3], we carried out a study with the transport model RQMD(v2.3)[4].

Following Ref. [3], particle azimuthal distributions were analyzed via the Fourier expansion:

$$\frac{dN}{d\phi} = v_0(1 + 2v_1 cos(\phi) + 2v_2 cos(2\phi))$$

where v_1 and v_2 are the anisotropy parameters and are related to the collective flow[5]. v_0 is a normalization constant. The ϕ is the azimuthal angular difference between particle and the event reaction plane. Within the experimental acceptance (p_t, y) cuts and centrality, approximate to the NA49 experiment, the azimuthal distributions of pions and nucleons were calculated and then fitted with the above equation. The extracted anisotropy parameters are shown in the figure as open circles with the NA49 experimental data are shown as filled circles.

For both protons and pions, the overall agreement between the model prediction and data is good. It is seen that the pions have an opposite flow with respect to that of nucleons and the maxima of v_1 are around the beam (target) rapidity for all particles. On the other hand, the model under-predicts the nucleon v_2 at mid-rapidity. In addition, (v_1, v_2) as a function of transverse momentum p_t was also under-predicted indicating that the model gives a wrong shape. This discrepancy has already been reported for collisions at about 10A·GeV[1]. Although the transport model can provide a qualitative agreement with the experimental data, it is still not clear that whether the observed event anisotropy is due to nuclear matter shadowing or of other dynamical origin. This is a subject that we are currently investigating[6].

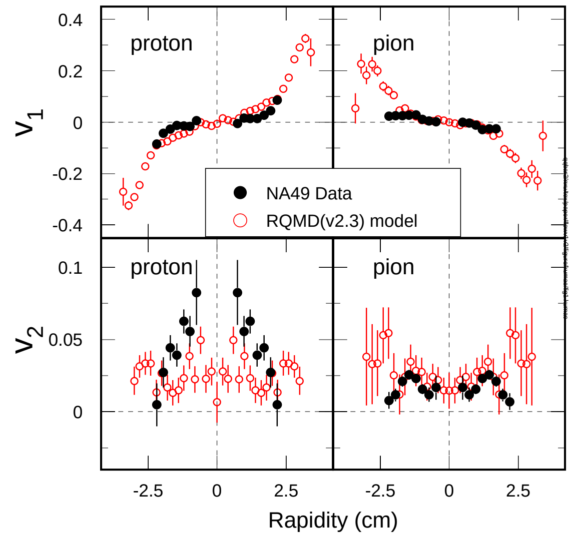

Figure 1: *The event anisotropy parameter (v_1, v_2) for proton and pion as a function of rapidity. The NA49 results[4] are shown as the filled-circles and the RQMD predictions are shown as open-circles.*

Footnotes and References

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